

APPENDIX E

(REPRINT OF)

“KEECHELUS DAM FISH PASSAGE AND SAFETY OF DAMS RECONSTRUCTION”

SEPTEMBER 2002

*[by R. Dennis Hudson,
Fish Passage Coordinator
Liaison & Coordination Group
Pacific Northwest Regional Office
U.S. Bureau of Reclamation
Boise, Idaho]*

TABLE OF CONTENTS

1.	PURPOSE	E-1
2.	BACKGROUND	E-1
2.1	Hydraulic Project Approval	E-2
2.1	Mitigation Agreement	E-2
3.	JUNE 2001 APPRAISAL DESIGN STUDY	E-2
3.1	Upstream passage concepts considered	E-2
3.2	Downstream passage concepts considered:	E-3
4.	CURRENT STUDIES	E-3
4.1	Project-wide assessment	E-3
4.2	Keechelus Dam	E-3
4.2.1	Upstream Passage	E-4
4.2.2	Downstream passage	E-4
4.2.3	Biological and habitat conditions	E-4
5.	SUMMARY AND STATUS	E-5

1. PURPOSE

The Bureau of Reclamation (Reclamation) began an assessment of fish passage potential at Yakima Project storage dams in April 2002. Initial efforts were directed towards evaluation of potential fish passage features at Keechelus Dam and the relationship of those features to the on-going Safety of Dams (SOD) reconstruction activities. The studies to-date support Reclamation's earlier decision to move ahead with the SOD reconstruction while continuing the investigation of the feasibility of providing future fish passage features at Keechelus and the other Yakima Project storage dams. The purpose of this paper is to summarize the studies that have been done to-date relating to the Keechelus Dam fish passage and SOD reconstruction issues.

2. BACKGROUND

During review of the Keechelus Safety of Dams Draft Environmental Impact Statement (DEIS), a large number of comments were received that dealt with the issue of fish passage at Keechelus Dam. Many commenters requested Reclamation include alternatives in the EIS that would provide fish passage at Keechelus Dam as part of the SOD project. Other commenters simply requested that Reclamation add fish passage at the dam as part of any alternative that did not otherwise provide for it. Another set of comments dealt with the issue of increased cost for retrofitting the dam with fish passage after any modifications are made as part of the SOD process. Finally, several commenters indicated that there was biological information available that indicated that fish passage would have substantial biological benefits and should be included on those grounds.

All of the fish passage comments were addressed in "Attachment A, Fish Passage Issues" to the Final Environmental Impact Statement (FEIS). Attachment A discussed authority for fish passage, design constraints, cost considerations, and biological information. After carefully considering the comments received and the information developed for Attachment A, Reclamation decided to proceed with the SOD work without providing fish passage features at the same time. The following statement appeared in the *Record of Decision (ROD) for Keechelus Dam Modification* that the Regional Director signed on January 18, 2002:

The decision is to proceed with the preferred alternative to modify Keechelus Dam along the existing alignment to correct identified safety deficiencies as documented in the FEIS.

In addition, Reclamation will seek funding under existing authorities to conduct a feasibility study for fish passage at all of the storage dams which are part of the Yakima Project. The feasibility study was not discussed in the FEIS, but is a result of further discussion with the State of Washington, National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS). As a result of those discussions, Reclamation is now prepared to conduct such a feasibility study, in cooperation with others and subject to appropriation of funds.

Further discussion and negotiations with the fisheries agencies subsequent to the ROD culminated in two documents that summarize the fish passage issues related to Keechelus SOD reconstruction and impose certain requirements on Reclamation in order to proceed with the SOD work. These are summarized below.

2.1 Hydraulic Project Approval

The first document is the *Hydraulic Project Approval (HPA) for Safety of Dams Reconstruction of Keechelus Dam* issued by the Washington Department of Fish and Wildlife (WDFW) on April 17, 2002. The HPA requires Reclamation to conduct a project-wide assessment of fish passage at all Yakima Project reservoirs with Keechelus Dam to be the first facility to be considered (provision #56). Provision #57 of the HPA requires Reclamation to:

1. Determine whether the proposed design and construction of the SOD project will adversely affect the feasibility, cost, or effectiveness of fish passage facilities at the dam.
2. Modify the SOD work if necessary to ensure that SOD reconstruction actions will not cause significant additional costs for retrofitting fish passage facilities nor require future modification of the portions of the dam being reconstructed as part of the SOD work.

2.1 Mitigation Agreement

The second document is the *Mitigation Agreement (Agreement) between the USDI Bureau of Reclamation and Washington Department of Fish and Wildlife regarding Keechelus Dam Construction Issues Including Fish Passage* signed on April 8, 2002. The Agreement covers the same issues as the HPA. In Paragraph II-8, Reclamation agrees to ensure that SOD reconstruction-related actions at Keechelus Dam will not result in significant additional costs for retrofitting fish passage facilities at the Dam nor require future significant modification of the portions of the dam being reconstructed as part of the SOD work.

3. JUNE 2001 APPRAISAL DESIGN STUDY

In June 2001, prior to the FEIS, Reclamation's PN Region Design Group prepared an *Appraisal Design Study for Keechelus Dam Fish Passage*. This appraisal design study examined potential methods for upstream and downstream fish passage at Keechelus Dam. The report summarized known information about the existing facilities, operations, and hydrology and described options to be considered to provide fish passage. The information in the report was confined to engineering issues related to habitat accessibility. Other factors that limit productivity and carrying capacity of Keechelus Lake and the headwater tributaries to the lake were not addressed.

3.1 Upstream passage concepts considered:

1. Trap and haul
2. Roughened channel fish ladder to right abutment with pumped ladder flow
3. Fish ladder to left abutment with pumped ladder flow

3.2 Downstream passage concepts considered:

4. Fish collection barge with a fish conveyance pipe
5. Fish collection barge with trap and haul
6. Stationary surface collector with a fish lock
7. Multiple level intake gates with multiple bypass pipes
8. Multiple level intake gates with Eicher screen
9. Multiple level intakes with bottom flow energy dissipation wells
10. Multiple level intakes with top flow energy dissipation wells

Costs for the upstream options ranged from \$7.5 million to \$13 million. Costs for downstream options ranged from \$3.5 million to \$30 million.

4. CURRENT STUDIES

4.1 Project-wide assessment

Reclamation has launched a preliminary assessment of fish passage at all of the storage dams of the Yakima Project and is seeking funding for detailed feasibility studies that may lead to implementation of fish passage features at the dams. Reclamation is proceeding with the preliminary assessment in phases as directed by the HPA. The HPA requires completion of Phase I of the assessment by January 2003 and Phase II by January 2004. The HPA also requires that interim passage (in collaboration with WDFW) be provided at selected sites within a year of completing Phase II of the study.

A core team of biologists and engineers from Reclamation, NMFS, USFWS, U.S. Forest Service (USFS), WDFW, irrigation interests, local governments, and others was organized in April 2002. Yakama Nation staff were invited to be part of this team but have not participated up to this point. The core team and sub-groups have met on several occasions to work through biological, engineering, and operational issues associated with fish passage at the storage dams.

4.2 Keechelus Dam

As required by the HPA, initial study efforts have been directed towards Keechelus to determine if the design and construction of the SOD project will adversely affect the feasibility, cost, or efficacy of fish passage facilities at the dam.

The concepts developed for the June 2001 *Appraisal Design Study for Keechelus Dam Fish Passage* mentioned above were thoroughly reviewed and discussed in the core team meeting in May. Several of the concepts were then dropped from further consideration due to technical problems and based on experience at existing similar facilities. These concepts either would not have functioned as intended or would have been detrimental to fish.

Some concepts cannot be built until the SOD work is complete. Other concepts were modified to eliminate conduits through the dam embankment to satisfy dam safety concerns. The concepts were also modified to eliminate conduits through foundation material in the maximum section of the dam.

This ensures that future construction of fish passage facilities will not require alterations to the major portions of the dam being reconstructed as part of the SOD work. The modified options were reviewed in the June core team meeting.

4.2.1 Upstream Passage — Modified versions of Concepts 1 and 3 for upstream passage were retained for future analysis to determine the best method of passing fish upstream into the reservoir. Each option still has unanswered engineering and biological questions that will require more in-depth discussion and analysis. Option 2 involved fish exiting the roughened channel fish ladder into Meadow Creek. Option 2 was dropped due to anticipated confusion to fish. Option 2 could still work if fish were not transferred into Meadow Creek, but it would offer no advantage over Option 3.

4.2.2 Downstream passage — Concepts 4, 7, 9, and 10 were dropped due to technical concerns. Concept 5 was retained for further analysis. A scaled-down version of concept 6 will be studied further and concept 8 will be considered further if bypass issues can be resolved. Two additional concepts for downstream passage were reviewed and discussed in the July core team meeting. Both concepts would include addition of gates to the spillway to permit surface releases of water. The idea would be to allow juvenile fish to pass through the spillway area in the spring when the reservoir pool is at maximum elevation. These concepts, in common with those previously mentioned, require further engineering and biological study.

4.2.3 Biological and habitat conditions — The core team is gathering existing data and evaluating physical and biological components of the Keechelus watershed ecosystem.

Physical components that will be addressed include:

1. Water quality
2. Habitat accessibility
3. Habitat structure
4. Channel condition and dynamics
5. Instream flow/hydrology
6. Watershed condition

Biological components include:

1. Predation
2. Competition
3. Pathogens/parasites
4. Mutualism

This information will help the team to estimate the likelihood of success of fish passage at the dam. The tradeoffs between passage parameters and expected biological gains¹ for different options will help the team formulate plans and establish priorities for continued study. Target species and migration periods have been identified, and other information is being assembled. Analysis of the biological data, formulation of more detailed passage options, and comparison with similar plans for the other project reservoirs will continue in Phase I and Phase II of the study.

¹ Estimated biological gains would include increased populations of steelhead, coho, and chinook; potential for reintroduction of sockeye; reconnection of isolated populations of bull trout; restoration of life history and genetic diversity of salmonids; etc.

5. SUMMARY AND STATUS

Providing fish passage at Keechelus Dam and the other storage dams in the Yakima Project will be a complex and challenging undertaking. Some of the challenges at Keechelus that must be addressed by engineers and biologists include:

1. Seasonal reservoir pool fluctuations of 85 feet in elevation
2. Harsh winter conditions that may influence the length of time that passage can be reasonably provided
3. Adult and juvenile migration periods that do not coincide with appropriate pool elevations or reservoir release patterns
4. Uncertainties associated with existing fish presence downstream of the dam and likelihood of fish using the passage facilities and successfully spawning and rearing in the lake and upstream tributaries
5. Potentially high costs with uncertain biological benefits
6. The difficulty of providing opportunities for volitional movement of fish, considering the realities of site limitations and operational parameters
7. Several different target species that require passage at different time periods

These questions, and many others, suggest that a cautious, measured approach be taken before investing millions of taxpayer dollars in facilities that may or may not achieve the intended purposes. The Phase I and Phase II Assessment will compare conditions at the different reservoirs and suggest implementation of interim pilot passage projects at the most promising sites. This will provide opportunities to test passage concepts and evaluate fish movement, spawning, and rearing success. Final fish passage designs will evolve from what is learned in the pilot projects.

The on-going SOD work will not impact the feasibility of building fish passage facilities in the future. As noted above, there are many unanswered questions regarding biological issues, engineering parameters and possible operational changes that must be resolved before proceeding with implementation of permanent fish passage facilities at the site.

Since a workable plan has not yet been identified, installation of any portion of a passage facility during the SOD reconstruction would be premature. The ultimate decision may be to install fish passage facilities; however, it could just as well be to develop an alternative to passage that would provide equivalent salmonid productivity and ecological function. In any event, the final decision does not depend on the SOD work nor would it be influenced in either a positive or negative direction by the SOD work.